



GUIDELINES FOR HEARING SCREENING



SEPTEMBER 2004

ACKNOWLEDGEMENTS

This manual was reviewed and revised based on valuable input from the following individuals:

Lisa Guillory, Au.D., Private Consultant, member of Audiology/Speech Pathology Commission,
Board of Healing Arts

Robin Gashler, M.A., Blue Springs School District

Amy Lane, M.S., Children's Mercy Hospital, Kansas City

Joey Ford, M.S., Children's Mercy Hospital, Kansas City

Kelly Gessert, AuD.

Larry Mazzeo, M.S., Rolla

Karen Bauer, M.A.

Steve Brown, AuD.

Pam Kaprowski, AuD.

Kristi Shilts, M.S.

Kerri Helms, M.S.

Tina Raymo, LPN, Union RXII School District, Union

Carolyn Cissell, RN, Springfield RXII, Springfield

Sheri Turner, LPN, Adair RII, Brashear

Patricia Wilson, RN, University City

TABLE OF CONTENTS

I. Introduction.....	1
A. Purpose.....	1
B. Objective	1
C. Characteristics of Population-based Screening Programs.....	1
II. Hearing	2
A. Normal Hearing.....	2
B. Hearing Loss – Defined.....	2
1. Conductive Impairments	2
2. Sensori-neural Loss.....	2
3. Mixed Hearing Loss.....	3
4. Unilateral Hearing Loss	3
5. Educational Implications.....	3
III. Screening.....	4
A. Assessment Schedule	4
B. History Related to Hearing.....	5
IV. Procedures.....	6
A. Observational Screening for Hearing Problems.....	6-7
B. Puretone Audiometry.....	7-9
C. Tympanometry	9-10
D. Physical Examination of the Ear	10
E. Screening Hard to Test Individuals	11
V. Setting up School-Based Screening Programs	12
A. School Screening Protocol	12-13
B. Use of Volunteers	12
C. Prescreening Education	13
D. School Screening Procedure.....	13-14
E. Referrals.....	14
F. Follow up	14-16
G. Program Management	16
VI. Screening for Dual Sensory Loss.....	17
Resources	18-19
Related Websites.....	19-20
Appendices	21

APPENDICES

Worksheet	A
Hearing Screening Program	B
Health Fair Reporting Form	C
Screening Report to Parent	D
Referral Letter to Parent.....	E
Student Referral Form – 2 pages.....	F
Tracking Form Hearing Screening.....	G
Statistical Hearing Screening Program Report	H

I. Introduction

A. Purpose

The purpose of any screening program is to detect those individuals with a suspected deviation that requires further examination.

B. Objective

The objective of the hearing screening program is to identify individuals with possible hearing deficits at the earliest possible stage in order to refer for diagnosis and treatment, if required. Hearing deficits in children can interfere with normal speech and language development, communication, and with the ability to learn. It is estimated that one-third of children with minimal or unilateral hearing loss fail a grade. Loss of hearing is considered a “hidden handicap.” It is important to detect even mild hearing loss in order to treat the problem or compensate for the loss when possible. Children with mild to moderate hearing deficits may be at a disadvantage educationally, emotionally, and socially.

C. Characteristics of Population-based Screening Programs

Screening is a brief or limited evaluation of a group of individuals presumed to be normal, but at risk of developing a problem. The extent of a screening program should be based on documented health needs of the population to be served. This need may have been determined by an outside agency, e.g., state health department, or identified on a local basis. The value of early detection of a problem must be weighed against the time and human resources required to conduct the screening. The value of the screening process depends on how well the program is carried out and how the findings are used. Results must be communicated, and follow-up on referrals for those “at risk” continued until the problem is resolved in some manner. Screening programs must be evaluated in terms of:

- Validity – ability to identify those who have the condition;
- Reliability – consistency of results of screening process;
- Yield – number of persons identified;
- Cost – personnel and equipment;
- Acceptance – informed parents agree to value of screening; and
- Follow-up – communicating results to parents who respond with appropriate actions to get necessary diagnosis and treatment, if indicated.

II. Hearing

A. Normal Hearing – Defined

Normal hearing occurs between –10 decibels and 20 decibels (loudness of sound). The ability to hear is more developed at birth than the ability to see. There is a normal developmental progression in the ability of an infant to respond to sound.

B. Hearing Loss – Defined

1. Conductive Impairments

Any dysfunction of the outer or middle ear is termed a conductive impairment of hearing. In other words, the difficulty is not with the perception of sound but with the conduction of sound to the analyzing system.

Conductive hearing loss results from injury to the outer ear, the eardrum, the hearing bones, or the middle ear space. This type of hearing loss can usually be corrected by medicine or surgery. Hearing aids are often helpful with this type of loss.

Causes of conductive hearing impairments:

- Wax buildup;
- Objects lodged in the ear (plastic toys, seeds, insects, etc.);
- Damage to the ear drum;
- Damage to the ossicles behind the ear drum;
- Infections of the outer or middle ear; and
- Fluid buildup in the middle ear.

2. Sensori-Neural Hearing Impairment

When the loss of hearing function is due to pathology in the inner ear, or along the nerve pathway from the inner ear to the brain stem, the loss is referred to as a sensori-neural impairment. In other words, sound is conducted properly to the fluid of the inner ear, but it cannot be analyzed or perceived normally. This loss can be discovered at any age. This type of hearing loss may be a sign of a serious illness and should not be neglected. Hearing aids may be helpful with this type of hearing loss. Medication and/or surgery most likely will not be of any help. High sound frequencies tend to be more affected, although some congenital losses affect all tones equally. Cochlear implants have been helpful to some individuals, especially if implanted early in childhood.

Causes of Sensori-Neural Hearing Impairment:

- Damage during fetal development or at birth;
- Familial-hereditary factors;
- Infections;
- Certain medications;
- Certain diseases;
- Prolonged exposure to excessive noise;

- Head injuries; and
- Aging.

3. Mixed Hearing Impairment

In some instances, an individual may exhibit symptoms of both conductive and sensori-neural hearing loss. For example, a child with a congenital sensori-neural hearing loss may also have some degree of conductive hearing loss due to otitis media. A patient with a mixed impairment shows some loss by bone conduction but a greater loss by air conduction.

4. Unilateral Hearing Impairment

An individual may have normal hearing in one ear and a hearing loss in the other ear that could impact learning. These children may benefit from hearing aids or a soundfield system.

5. Educational Implications

There are many factors that affect the speech/language abilities and academic success of each child. Some children have severe loss, very intelligible speech and make good grades. Other children with very mild loss and little family support exhibit considerable academic failure. Some get hearing aids very early, some get them way too late. Some have parents that get the child to therapy regularly from an early age, and some have parents who never make any effort to enrich the child's language learning. There isn't a way to categorize expected performance or handicap based on hearing loss. Labels such as mild, moderate, severe or profound, based on the pure tone thresholds do not predict handicap or academic success. The possibility of hearing loss, however mild, needs to be evaluated to assure attention to a barrier to learning.

III. Screening

A. Assessment Schedule

Hearing screening begins at birth and continues throughout life. The following schedule lists the methods of screening appropriate for individuals at different ages; as the age of the person being screened changes, so should the screening protocol. Specific program guidelines may differ from the following recommendations:

At birth	-	Newborn Hearing Screening Use High Risk Register Criteria
Birth to 6 months	-	High Risk Register Criteria Observational Screening (startle response) Parental screening questions a-c Otoacoustic Emissions screening
7-12 months	-	High Risk Register Criteria + Supplemental questions Parental screening questions a-c Observational screening Tympanometry Otoacoustic Emissions screening
13-18 months	-	High Risk Register Criteria + Supplemental questions Parental screening questions a-e Observational screening Tympanometry Otoacoustic Emissions screening
19-24 months	-	High Risk Register Criteria + Supplemental questions Parental screening questions a, f and g Observational screening Tympanometry Otoacoustic Emissions screening
25-36 months	-	High Risk Register Criteria + Supplemental questions Parental screening questions a, f and g Otoacoustic Emissions screening Pure tone audiometric screening Tympanometry
3-6 years	-	High Risk Register Criteria + supplemental questions Pure tone audiometric screening Tympanometry
6 years and older	-	Health History Pure tone audiometric screening Tympanometry

B. History Related to Hearing

Children born in Missouri after January 1, 2002, should have received a Newborn Hearing Screening, as required by law, to detect hearing loss present at birth. All hospitals delivering babies must now assure a screening is performed. For a variety of reasons, e.g., equipment failure, home births, etc., this may not occur, but the vast majority will have been screened. In addition, a variety of conditions may put a child “at risk” for developing hearing problems after birth (see High Risk Register). Some children with significant hearing loss are identified after one year of age when behaviors may indicate inability to hear. Children with a health history that includes the following conditions should be observed for the development of a hearing loss.

1. High Risk Register (for early childhood screening)

Some babies may be identified at birth as being “at risk” for hearing impairments. Following is a list of criteria to indicate infants who might be considered at risk:

- a) Family history of any blood relative with childhood hearing impairment;
- b) Rubella or other nonbacterial transplacental infection (e.g., cytomegalovirus infection, herpes infection, syphilis);
- c) Defects of ear, nose, or throat. Malformed, low-set or absent pinnae, cleft lip or palate (including submucous cleft), any residual abnormality of the otorhinolaryngeal system;
- d) Birthweight less than 1500 grams;
- e) Bilirubin level greater than 15 mg/100 ml serum or exchange transfusions;
- f) Significant asphyxia associated with acidosis, as determined by attending physician; and proven meningitis;
- g) Low Apgar Scores (0-3 at five minutes, 0-6 at 10 minutes);
- h) Respiratory distress; and
- i) Physical features associated with syndromes that include progressive hearing loss.

If one or more of the criterion are present, refer the infant to the appropriate health care professional.

2. Supplemental Questions

- a) Did the child receive a Newborn Hearing Screening?
- b) Does the child presently have a continued, or recurrent ear infection?
- c) Has the child suffered from any of the following: meningitis, encephalitis, cerebral palsy, mumps, head injury, or birth defects?
- d) Was the child in an intensive care nursery after birth?

3. Parental Screening Questions

- a) Have you had any worry about your child’s hearing?
- b) When he’s sleeping in a quiet room, does he move and begin to wake up when there is a loud noise?
- c) Does he turn his head directly toward an interesting sound or when his name is called?
- d) Is he beginning to repeat some of the sounds that you make?

- e) By 15 months, can he use three or four words correctly other than “mama and dada?”
- f) Can he identify familiar pictures when you name them?
- g) Does he name things when he wants them, like candy or juice?

IV. Procedures

A. Observational Screening for Hearing Problems

Techniques for screening are as stated below and are intended for use in a well-baby clinic, physician’s office, or parent’s home, as in “Parents as Teachers programs.” The screener should be trained to do the observational screening and have the appropriate materials.

- Select a quiet room for screening with little distraction from the outside.
- Have several noisemakers available – squeeze toys, bells, rattles, etc. Select these carefully to provide a variety of pitch and intensity levels.
- Seat the mother on a chair, with the child on her lap. A colorful toy should be available as a distraction, but it should not be too attractive or it will engage the entire attention of the child.
- The screener kneels at a 45-degree angle to the side of the child, with the distracting toy in one hand and the noisemaker well hidden in the other. When the toy held in front of him engages the baby’s attention, the screener makes a sound with the noisemaker in the hand, held close to the floor, out of the peripheral vision of the child. If an orientation response is seen after one or two presentations of sound, the screener moves to the other side. The screener will learn by experience that for the 0-4 month age level, the noisemaker must be presented loudly; by 6-9 months, it can be presented more softly; and by 10-12 months, it should be made as soft as possible.

The expected response is some sort of head turn toward the sound. An exact description of the head turn and accompanying eye movement should be noted. A normal-hearing child’s orientation to sound will progress as follows:

- Newborn - arousal from sleep, or eye widening, eye blinking
- 3-4 mos.- rudimentary head turn, a wobble of the head even slightly toward the sound
- 4-7 mos.- localization to side only
- 7-9 mos.- localization to side and indirectly below
- 9-13 mos.- localized to side and below
- 13-16 mos.- localized directly to all signals to side, below, and above
- 21-24 mos.- locates directly to a sound at any angle

Interpretation of Observational Screening

When there appears to be no response, the screener should repeat the use of a particular stimulus at his discretion until the observer is satisfied that the failure to respond is genuine. Two repetitions should be adequate to establish this fact.

It must be kept in mind that the failure of the child to locate the sound does not always indicate that the child did not hear it. The simple fact that the child may not be interested in that particular sound can account for the lack of response. For this reason, more than one stimulus in a particular pitch range should be available for use at the discretion of the screener. In addition, it is important to conduct the screening when the infant or child is otherwise alert and calm.

Referral Criteria for Observational Screening

In making the observations previously described, a hearing loss should be suspected if the child does not respond appropriately on either side, or if he orients to the wrong side. The child who deviates markedly in these behaviors should be referred for further testing.

Tympanometry or pneumatic otoscopy and rescreening of failures may significantly reduce false positives and over-referrals. An infant who fails these additional tests should be referred to an appropriate health care professional.

B. Puretone Audiometric Screening

The American Speech and Hearing Association recommends that screeners be trained by an audiologist.

This screening assesses the ability to hear single tones, presented at varying levels of pitch. If the individual hears the tone, they indicate that they have heard the tone using a pre-arranged signal to the screener. The result is recorded as “Pass” or “Fail.”

1. Screening Equipment

Schedule a room that is as quiet as possible. Consider all noise; plumbing, heating/cooling systems, traffic, office machines, appliances, fluorescent light “buzz,” talking in adjoining rooms, music, etc.

Have a desk or table that will provide space for the audiometer and recording materials. Two chairs will be needed for the screener and the individual to be screened.

Leave the audiometer on all day when screening.

Set all connections, dials, and switches on the audiometer in the correct position.

Screen yourself, or another person who is known to have good hearing, before doing any screening to be sure the audiometer is working properly.

Audiometers should be calibrated by a qualified technician, at least annually.

There should be a “standard precautions” policy and procedure in place to assure earphones are properly cleaned between children.

2. Preparing the Person for Testing

Do not screen children with a known hearing loss who wear a hearing aid, or who are under the regular care of an ENT provider.

Consider each person individually; some precocious children three years old can be screened audiometrically, but some children ten years old cannot.

Seat the person in a chair facing away from the examiner so the person whose hearing is being screened cannot watch the audiometer or the screener’s movements and expressions.

Shy, and other difficult to screen children may need to be screened facing the examiner with their eyes closed.

Give test instructions before putting the earphones on the individual, and determine how they will indicate they have heard a sound.

Tell them they will hear some tones or “beeps” and that they should respond to the sound even if it is “very soft or tiny.” The individual could respond by one of the following ways:

- Raising hand
- Saying “yes” or “I hear it”
- Nodding head

- Holding block, chip, or bead close to ear then dropping it into a container when the sound is heard (use with young children)

Individual Sweep Screen Procedure

After the individual has been instructed in the procedure, begin the screening:

- Put the earphones in place.
- Make sure hair is not under the earphone and that earrings are removed.
- Adjust earphones so they fit snugly over the outer ear, with the speaker (center) of the earphone over the ear canal.
- The RED earphone should be placed on the RIGHT ear, the BLUE on the LEFT ear.
- Set the LOUDNESS dial to 20 decibels (dB). If you are in an environment with some ambient noise that cannot be eliminated, the screening should be rescheduled or relocated to a quieter environment.
- Set control so that the tone or stimulus comes only after the examiner activates the switch.
- Present stimulus twice as a short tone of approximately 1-2 seconds. Do not present the stimulus in such a rhythm that the person being screened is given clues as to when to respond. Screen the frequencies in this order:
 - 1,000
 - 2,000
 - 4,000
- When screening older students or adults, you may wish to screen at 6,000 to detect noise-induced hearing losses.
- Mark the results as Pass or Fail for each frequency
- Screen the LEFT ear in the same manner. Tell the person being screened when you are changing to the other ear.

Interpretation of Screening Results

Individuals who pass all frequencies in each ear are presumed to have normal hearing.

Rescreen any individual who fails one or more frequencies in one or both ears.

Rescreens also may be done on the basis of observations and/or symptoms.

If you are doubtful about the validity of screening results, so indicate on the recording form.

Rescreening Procedure

- Rescreening may be done at the time of screening. Earphones should be removed and then repositioned, checking carefully to be sure the ear canal is not soft and collapsed due to placement of the earphones. If this appears to be a problem, the ear can be pulled up and back, or the skin in front of the ear gently pulled forward as the earphones are placed.
- Instructions should be repeated to be sure student understands the procedure.
- Rescreening may done up to two weeks later if the student has cold and allergy symptoms. This time period may allow symptoms to clear.
- Prepare screening site and equipment as for Individual Sweep Screen.
- Set loudness dial at 20 decibels.
- Screen the frequencies in the same order. Present each frequency twice. If the student fails to respond one of two times, it may be repeated to assure that it was not a lack of attention that caused the lack of response. If both presentations are missed, it should not be repeated. Screen hearing in each ear.

- Record as “P” those sounds heard at 20 dB, record as “F” those tones not heard at 20 dB.
- Refer for medical and/or audiological evaluation any individual who misses one or more frequencies in one or both ears. In schools, an audiologist may be asked to do an “individual threshold test” prior to referral. This information may be helpful to the professional doing the evaluation.
- It is estimated that about 3-9 percent of students will fail a hearing screen and warrant referral.

C. Tympanometry

Tympanometry (impedance unit) screening and/or pneumatic otoscopy by appropriately trained individuals may be used as additional screenings with this age group. These screenings are useful in identifying children with otitis media, which has the potential to cause a conductive hearing loss. This information will be helpful when deciding what type of referral to make. Children with possible conductive hearing losses should be referred to their primary care provider for medical evaluation.

Tympanometry is an objective measure of the mobility of the tympanic membrane. It is particularly suited to the examination of children because:

- It does not require the child’s perception of or response to sound;
- It can be conducted without regard to noise in the environment;
- It requires little or no mobilization;
- It is not traumatic;
- It can be performed quickly; and
- It is not adversely affected by usual amounts of cerumen found in the auditory canal.

Tympanometry takes advantage of the natural flexibility of the eardrum to measure pressures within the middle ear space. By generating minute air pressure changes in the outer ear, tympanometry determines the mobility of the eardrum, which is affected by whatever the air pressure is behind the eardrum.

Tympanometry is painless and takes only three seconds to complete. Nothing penetrates the ear canal. The soft rubber cuff on the probe assures a gentle seal. During the test, a soft tone is transmitted through the probe, while the air pressure is changed in the outer ear canal. The patient is not required to respond; results are automatically recorded in graph form, called a tympanogram. The graphs represent the underlying condition of the middle ear, which is described in terms of types of curves.

Screeners should be trained by an audiologist, when possible, in order to be able to interpret results accurately. Screeners should refer to equipment manual for instructions on use and care of the tympanometer. Manufacturer’s representatives are often available to inservice school health personnel on the operation of the machine.

The Health Services should have a “standard precautions” policy in place to assure that ear probes are properly cleaned between children.

Interpretation of Results

- Type **A** curves are seen in patients who have normal middle ear function.
- Type **As** curves suggest normal middle ear pressure, but with an indication that the stapes have become partially immobilized.
- Type **Ad** curves may be associated with flaccidity of the tympanic membrane or separation of the middle ear bones.
- Type **B** curves are seen when the middle ear space is filled with fluid.
- Type **C** curves are conditions in which the pressure in the middle ear is below normal. This negative middle ear pressure may be seen in cases of retracted eardrum and poor Eustachian tube function.

Referral Criteria:

Type B curve – Rescreen in one month. If still Type B, refer for medical follow up.

Type C curve – Greater than –200 negative pressure. Rescreen in one month. If negative pressure still greater than –200, refer for medical follow up. Rescreen even if student passed puretone audiometric screening.

Type As curve – Do not refer for medical follow up unless puretone screening indicates a hearing impairment.

Type Ad curve – Do not refer for medical follow up unless puretone screening indicates a hearing impairment.

Children with tubes in their ears do not need referral as they are already under care, and will usually have a “flat” tympanogram.

If there is an inability to seal the ear canal for tympanometry, rescreen in one month. If still cannot get seal, refer for medical follow-up.

Rescreen students with negative (normal) tympanometry tests if they failed pure tones. The tympanometry screening is simply additional information for the health care provider.

It is important to remember that tympanometry is **NOT** a hearing test. It is a procedure to help determine if one has fluid or infection in the middle ear. Tympanometry gives the health care provider precise information concerning the middle ear, and allows the provider to plan the best treatment. Some local health care professionals may need an explanation of the results of the tympanometry. Printed reports, with graphs, will need to be submitted to the professional.

Refer to audiology only if the student passes the tympanometry but fails the pure tone audiometric screening, unless the student is undergoing special education testing and/or concerns are noted by the parent or staff.

D. Physical Examination of the Ear

The nurse can examine the outer ear for physical abnormality, infection, or inflammation.

School nurses who have had instruction in use of the otoscope may want to examine the ear canal for obstruction by cerumen, and to visualize the tympanic membrane for perforation, thickening, inflammation, or evidence of otitis media. If skilled in pneumatic testing, the nurse can observe the tympanic membrane for mobility.

The most thorough screening for auditory problems includes otoscopic examination, puretone audiometric screening and tympanometry. Children who fail the puretone screening should be considered for these additional tests before referral decisions are made.

E. Screening Hard-to-Test Individuals

Selection of the method of screening should be based on developmental age. Some students with developmental delays will be able to be screened, at least grossly, using techniques designed for very young children. These include Conditioned Play Audiometry.

A picture-pointing task is done using simple pictures of items with which the child is familiar, ball, car, house, etc. This is done at normal speech level. The screener would then ask the child to point to a specific picture, using a whispered voice without visual cues. Audiometers with headphones are available that incorporate picture boards and spoken cues for use with young children. These audiometers are available with both English and Spanish spoken cues.

General observation of a student responding to noise in the classroom is another way to grossly determine hearing ability.

Conditioned Play Audiometry can be used to screen hearing in children with a developmental age of 30 months through five years of age. The response to the sound is conditioned through play activities. Activities include doing something with a toy, i.e., dropping a block into a bucket, touching or moving a toy whenever the child hears the signal. Once the response is conditioned, earphones are placed on the child, and they are instructed to do the same activity when they hear the sound. If the child is able to cooperate wearing the headphones, the screener should be able to screen hearing using these play techniques in each ear. Children in special education might have these conditioning activities written into their Individual Education Plan to facilitate eventual screening.

Otoacoustic Emission Testing Systems

Otoacoustic emissions (OAE) is new technology available to identify possible hearing loss. The OAE system uses a probe inserted into the ear canal to detect middle ear pathology and cochlear hearing loss. This testing does not require a response from the child so it can be used on very young children, those with developmental delays, or non-English speaking children. A “pass” indicates normal hearing and normal cochlear function. A “refer” indicates a possible hearing loss greater than 30 dB or an outer or middle ear disorder, e.g., otitis media. This new type of equipment accomplishes both screening for hearing loss and otitis media in one test.

V. Setting Up a School-Based Screening Program

A school-based hearing screening program should be coordinated by the school or community health nurse. The planning should occur with school administration. Hearing screening programs should be a part of an overall hearing conservation program. This program should:

- Establish procedures and standards (best practices) to determine whether or not the client may have a significant need for hearing health care;
- Provide personnel and facilities to reach the target population;
- Enter the client into a health care system which can provide follow-up care including rescreening, monitoring, further diagnosis and/or treatment;
- Provide counseling and education about hearing health to prevent the development or recurrence of hearing impairments and to prevent or reduce the handicap resulting from that impairment; and
- Reach all children at the earliest age possible.

Screening programs in schools are conducted by a variety of personnel from speech-language professionals to trained volunteers. It is appropriate for school nurses to organize and conduct hearing screening programs to identify children who would benefit from medical or audiological evaluation. A good hearing screening program will also reduce follow-up costs as further diagnosis and therapy are not needed for individuals determined to have normal hearing.

A. School Screening Protocol

It is estimated that up to 15% of students will have at least a transient loss of hearing at some time during their school years. The individuals/grades to be screened should be based on the availability of trained screeners, the environment available in which to screen, and the ability to complete a high percentage of the referrals. Emphasis is always placed on the youngest population. The following list considers the value of the screening to the population listed. In some settings, the first two groups of students may be the only group screened. In other settings, time and resources may permit all groups on the list to be screened.

New students (would include PreK - Kindergarten) and special education evaluations

Any student referred by teacher, parent, or student personally

Students in 1st, 2nd, and 3rd grades

Students at 7th grade – for educational purposes regarding noise exposure

Students at 11th grade – vocational counseling

B. Use of Volunteers

Volunteers may be useful during the initial sweep screening to assist with the flow of students through the screening procedure. Some volunteers may be trained to conduct the initial sweep screen. Holding a volunteer instruction session is helpful for all new volunteers, and should be scheduled close to the day of the screening. During the training session, familiarize volunteers with the audiometers, screening forms and procedures. Having volunteers who feel comfortable

with the equipment increases accuracy during the screening procedure. All volunteers should be counseled regarding confidentiality issues.

C. Prescreening Education

The nurse responsible for the screening should meet with kindergarten children as a group to orient them to the equipment and procedures in the screening program. This can be accomplished by taking the audiometer to the classroom for visual inspection. Demonstrate how they will have headphones placed over their ears in order to hear the sounds. Tell them they will hear a tone or sound like the one being demonstrated, only softer. Set the frequency at 1000 Hz and the decibel level at 90-100. Hold the earphones with the openings facing the children. Instruct them to raise their hand when they hear the sound. When the sound stops, instruct them to lower their hand. They can also say "I hear it" when the sound is presented. The extra time spent conducting these practice sessions will reap benefits during screening as the children will have a better idea what is expected of them.

In the primary grades, it is helpful to visit the classroom prior to screening to review the procedure. At this time, the nurse can provide age-appropriate information about noise in their daily lives. Loud sounds can destroy hearing in many people while they work or play. Extremely loud sound can damage hearing in a short period of time. Older students should be reminded of the danger of prolonged exposure to loud noise. Rock bands can exceed permissible limits because of high amplification electronic equipment. Temporary hearing loss has been noted in teenagers who attend concerts; hearing usually returns to normal. However, repeated exposure may cause permanent hearing loss. Hearing can also be affected by repeated exposure to farm equipment, chain saws, firearms, motorcycles, in industrial shop class and "walk-man" type radio/stereo units.

D. School Screening Procedure

1. Administer an initial sweep screen, presenting tones at 1,000, 2,000, and 4,000 Hz, in each ear, at 20 decibels.
2. Record as Pass or Fail at each level. If one or more frequencies are failed, in either or both ears, schedule for rescreening. It is sometimes helpful to wait for an interval of 10 days to two weeks for colds, allergies to resolve. However, knowing that a student has a hearing impairment when the child has allergic symptoms is important information, especially when the hearing impairment clears when the child is treated with medication. Make a note if the child is on medication and passes the rescreening.
3. Rescreen with the same procedure. If the student still fails one or more frequencies in one or both ears at 20 decibels, they should be referred for further evaluation.
4. If the school has an audiologist, they may be asked to perform an individual threshold test to determine the need for a referral.
5. If the school speech and hearing specialist does routine hearing screening, the nurse may collaborate to ensure adequate referral follow-up.

It is not appropriate to make adjustment for a noisy environment, i.e., increasing the level of decibels above 25 for the screening. The range of normal hearing is -10 to 20 decibels. Increasing the decibel level while screening could overlook children that should be referred for evaluation. Screening for hearing problems during “health fairs” is not productive unless the facility provides a quiet environment in which to screen, e.g, sound-treated van.

All failures on initial screen should be rescreened to confirm the need for further evaluation. There are a few obvious conditions that might warrant an immediate referral, but in most cases, the rescreening will eliminate some unnecessary referrals. Failure may be due to misunderstanding of directions, misinterpretation of information, poor placement of earphones, student fatigue or the inability to attend to testing. In addition, the student’s past health history, teacher observations and history of previous screening and outcome of referrals should be considered in making a referral decision.

E. Referrals

Referral criteria in this manual may be used, but it is important to have a consensus of the medical and audiological professionals in the community regarding what they consider indicates need for further examination. The nurse has the responsibility for follow up of referred students. The family should be notified of the results of the failed hearing screening and any other evaluations conducted, and of the need to obtain professional care. Ideally, a telephone call or personal visit to the parent should precede a written referral. This provides an opportunity to determine the parent’s understanding of the referral, to gather any pertinent information about prior history or outcome of previous referrals, and to determine whether the family has the information and resources to complete the referral. The nurse, or speech language pathologist, should be prepared to explain the results of the screening and the importance of a thorough follow-up examination to the parent/guardian, or student, as appropriate. Parents should understand the extent of the examination needed, i.e., primary health care provider, ear, nose, and throat specialist, audiologist or speech-language professional. The nurse should inform the parent that the screening was not conducted in a sound-treated environment and provide written information regarding the findings on any screening or evaluations done by school personnel. The parent should expect that the health care provider might need to do more comprehensive evaluation. The referral form should communicate the findings of the screening, as well as any additional observations made in the school setting. The nurse should request a written report from the professional with the results of the examination and any recommendations for the school setting. Referrals should be made on school district or school health services letterhead.

It is helpful to provide information about the appropriate services available in the area, the average cost of a visit, what to expect from the examination, etc. Families of students in managed healthcare programs may need to contact their health insurance plan for information on how to access the appropriate services, including treatment, that is available to them.

F. Follow Up

The nurse should develop a method of tracking the referrals made. It is not unreasonable to expect a response from the parent/guardian within a two-week period, demonstrating that the parent/guardian understands the referral and has made an appointment for the evaluation. The parent/guardian should be contacted periodically until the nurse knows the disposition of the

referral. Many times the parent/guardian is reluctant to say they cannot afford the cost of the evaluation. The nurse should be aware of community resources for those who need this financial assistance and offer this when indicated.

1. Tracking Referrals

Tracking logs should make note of when the referral was made, how the parent was contacted and when, date of professional evaluation and result of follow-up. This will allow for evaluation of the screening program for validity (identified children who have a hearing deficit), reliability (consistency of results of screening process) and yield (number of students identified with a problem). Positive findings occur much more often in early elementary grades (up through grade 3) and less often in older students. For this reason, it is not considered productive to screen large groups of students beyond 3rd grade. Some schools screen students at the secondary level as part of a hearing conservation program educating them about the causes of high-frequency loss due to noise pollution. In addition, it is important to identify the reasons for incomplete follow-up so the cause may be addressed. This would include inability to follow up due to financial constraints (need to work on resources), parent inattention (need for more education re screening program and impact of hearing deficit on school work), and lack of providers to complete the referral (need to develop assistance to get student to closest provider).

Following an evaluation, the nurse has the responsibility to see that any recommendations that have been made are implemented. Any child that has been referred for a hearing evaluation needs to be put on a “watch list” and monitored at least annually to determine their status. Ideally, a repeat audiometric screening should be done two-to-four weeks after treatment. The nurse could perform this screening if the provider of the treatment does not do it.

2. Teacher Notification

The nurse should notify the child’s teacher(s) that the child has been referred for a possible hearing impairment. In addition to being alert to the possibility the child is having hearing difficulty, the school personnel are often in a position to reinforce the need to follow through on the referral. It is important to monitor the child closely; documenting the nurse and teacher concerns for the effect the suspected hearing impairment is having on the child’s education. These concerns need to be communicated to the parent. Trying to establish the reason for failure to have the child examined will often uncover the need for additional resources or information.

3. Watch List

School nurses should make note of students who would benefit from monitoring for hearing difficulty. Some of the reasons to include a student are:

- Family history of risk factors;
- History of frequent ear problems in infancy and preschool period;
- History of allergic responses affecting the ear, nose and throat;
- History of academic failures, i.e., repeating grades;
- Enrolled in special education programs;
- Repeated concerns of teacher;
- Behavior that might be due to a transient problem with decreased hearing, i.e., allergies; and

- Students that consistently fail a frequency, in the speech range, but do not meet referral criteria.

The nurse would not necessarily generate a referral for evaluation, but could communicate the findings to parents and teachers, especially regarding any change in status.

The following information should be recorded in the individual's health record:

- The results of the screening and any rescreening;
- Notification of parents about the need to seek an evaluation from a medical or audiological professional; and
- Results of the professional evaluation and recommendations.

G. Program Management

The school nurse is an appropriate person to assume management of the hearing screening program. In schools where the speech-language specialist does the screening, the nurse may refer students for screening, and assist with follow-up. It is important to see that results of the screening are recorded in the student's health record. If the nurse is doing the screening, she will need to determine which groups and individuals will be screened, schedule the screenings, conduct them and then evaluate the overall effort.

School nurses may develop or adapt forms for their use in screening programs. Forms may include:

- Screening worksheets
- Pertinent history/observation for use in rescreening/referral
- Parent notification of normal/abnormal results
- Tracking logs by type of screening
- Tickler system as reminder to re-contact parent/guardian
- Statistical reports by screening for use in program evaluation

A number of sample forms have been included. All sample forms may be duplicated. Referral forms should include district information (e.g., on letterhead).

Screening programs must continually be reviewed for quality assurance purposes if they are to produce valid results and appropriate referrals. To assure quality, the school nurse should:

- Have equipment calibrated at least yearly, and maintain properly;
- Document adequate training of volunteers and paraprofessionals;
- Ensure the best environmental conditions for screening, e.g., minimal ambient noise;
- Adhere to established screening protocol;
- Complete follow up of referrals to extent possible; and
- Periodically evaluate screening program for validity and reliability.

VI. Screening Students For Dual Sensory Loss

Students who are born deaf, or have a profound hearing loss should be screened for the possibility of a genetic disorder, Usher Syndrome. This condition is of very low incidence (3 to 6 percent of the deaf population have Usher's) but the condition, if present, will progress to total blindness. The individual develops retinitis pigmentosa (RP), usually in adolescence. It is important to identify these students as early as possible in order to prepare them for the future. Deaf students may function well using sign language or lip reading, but when they lose their vision, they must develop other means of communication. Students identified with Usher Syndrome are often referred to special centers where they learn communication skills and mobility before they become totally blind.

If there are students in the population who are congenitally or profoundly deaf, it is helpful to complete the Usher Syndrome Screening checklist. This checklist can rule out more than 99 percent of the students who might need further screening. The Vision Screening Guidelines contain the checklist and directions to test for balance (vestibular dysfunction), dark adaptation and loss of peripheral vision that occurs with RP.

There are three types of Usher Syndrome:

Type I	Congenitally Deaf Impaired balance Retinitis Pigmentosa	up to 90 percent of Usher Syndrome
Type II	Moderate to severe hearing loss Normal balance Retinitis Pigmentosa	up to 10 percent of Usher Syndrome
Type III	Progressive hearing loss, normal at birth Fifty percent have balance problems Retinitis Pigmentosa Possible mental retardation	

Not all students with a hearing loss and RP have Usher Syndrome. Type II and III will be mainstreamed in schools, so it is important to remember this possibility when reviewing your hearing screening results.

There is no cure for Usher Syndrome and no way to prevent it. You can screen high risk students. If you find there is reason for concern after doing the additional screening by history and expanded vision and balance testing, the family should be contacted and a referral made for diagnostic testing.

Resources

The nurse has a responsibility to identify the health professionals at the local, regional and state levels that are qualified to evaluate suspected hearing problems. In addition to local health care providers, families may need referral to an audiologist. These professionals usually work in hospitals and Ear, Nose and Throat (ENT) physician offices. Major hospitals with extensive audiology services, i.e., Children's Mercy in Kansas City, St. Louis Children's, St. John's in Springfield and University Hospital in Columbia have audiologists on staff. These offices could also make referrals for audiologists in private practice. Other resources for assistance with hearing problems include:

- MC+ (state subsidized children's health insurance for low-income families)
- Speech and hearing clinics, university based and private
- Missouri School for the Deaf

MC+

If a parent indicates there is a financial barrier to following up on the recommendation, the first step is to determine if the student is financially eligible for assistance through the MC+ program operated by the Missouri Department of Social Services, Division of Medical Services. This is a program for low-income families. Access to the program is through the local Division of Family Services (DFS). If a parent/guardian does not have a Medicaid card for the student and is interested in exploring this, they should be provided with an application to complete and send to the DFS office. Many children, eligible for the free/reduced lunch program, will qualify. Many schools have personnel trained to facilitate this process. The MC+ program will pay for evaluation, diagnosis and treatment. The financial criteria changes on a yearly basis. The current eligibility requirements may be obtained through the local DFS office.

University Speech Pathology and/or Audiology Programs

Central Institute of the Deaf
Speech and Hearing Clinic
818 South Euclid
St. Louis, MO 63110
(314) 454-2613

Central Missouri State University
Speech and Hearing Clinic
Warrensburg, MO 64093
(660) 543-4993

Fontbonne College
6800 Wydown Blvd.
St. Louis, MO 63105
(314) 889-1458

Lincoln University
Lafayette and Marshal
Jefferson City, MO 65101
(573) 751-2325

St. Louis University
Department of Communication Disorders
Speech and Hearing Clinic
3750 Lindell Blvd.
St. Louis, MO 63108
(314) 977-2825

Southeast Missouri State University
Speech and Hearing Clinic
One University Plaza
Cape Girardeau, MO 63701
(573) 651-2155

Southwest Missouri State University
Speech and Hearing Clinic
901 South National
Springfield, MO 65804
(417) 836-5000

Northeast Missouri State University
Speech and Hearing Clinic
161 Violette Hall
Kirksville, MO 63501
(660) 665-5121, Ext. 7240

University of Missouri- Columbia
Speech and Hearing Clinic
Parker Hall
Columbia, MO 65201
(573) 882-3873

Joseph Institute for the Deaf
1809 Chesterfield
St. Louis, MO 63017
(636) 532-3211

Cardinal Glennon Children's Hospital
1465 S. Grand Blvd.
St. Louis, MO 63104
(314) 577-5600

Missouri School for the Deaf

The School for the Deaf has a number of resources available to schools and families. Any Missouri resident, 0-21 years of age, can receive an audiological evaluation at no charge. In addition, there is an Outreach Coordinator who assists schools with children with hearing impairments. Individuals can rent hearing aids, and schools can rent soundfield FM systems and auditory trainers by the school year. If a family has hearing needs, they can be directed to call the

Missouri School for the Deaf Resource Center
505 East 5th Street
Fulton, MO 65251
Phone 573-592-2543
<http://rcd.msd.k12.mo.us/evaluation>

In addition, some school health programs have developed resources at the local level to assist families to obtain care for which no other source of funding has been identified. This may be a medical emergency fund, church groups or local organizations such as Optimist Clubs. It is helpful to provide the parents with a list of appropriate referral sources as part of the referral process.

Websites related to hearing:

General information

Nlm.nih.gov/medlineplus/
www.noah.health.org
www.entcolumbia.org/childscrn.htm
www.aafp.org/afp/20030601/practice.html
www.kidshealth.org/kid/health
www.health.discovery.com/diseases
<http://specialchildren.about.com>
www.lib.uiowa.edu/hardin/md/oto
www.teachersfirst.com/deaf
www.hearingloss.org
www.otikids.com

Hard to test (infants and children)

www.med.umich.edu/childhearinginfo

www.cincinnatichildrens.org/health/info/ent/procedure/hearing-test.htm

Noise induced hearing loss

Nidcd.nih.gov/health/hearing/wisears

Hearing aids

<http://deafness.about.com/cd/hearingaids/>

www.hearingaidhelp.com

APPENDICES

Worksheet

Hearing Screening Program

Health Fair Reporting Form

Screening Report to Parent

Referral Letter to Parent

Student Referral Form – 2 pages

Tracking Form Hearing Screening

Statistical Hearing Screening Program Report

Name		Grade
Date		Decibels
Frequency	Right	Left
1,000		
2,000		
4,000		
6,000 (Optional)		

Name		Grade
Date		Decibels
Frequency	Right	Left
1,000		
2,000		
4,000		
6,000 (Optional)		

Name		Grade
Date		Decibels
Frequency	Right	Left
1,000		
2,000		
4,000		
6,000 (Optional)		

Name		Grade
Date		Decibels
Frequency	Right	Left
1,000		
2,000		
4,000		
6,000 (Optional)		

HEARING SCREENING PROGRAM

Re-screening Worksheet

Name _____ Age _____ Grade _____ Teacher _____

Parents _____ Address _____

Phone _____ Health Care Provider _____

Conditions Indicative of Possible Hearing Loss: (teacher observations and health history)

- _____ Repeated colds
- _____ Cold today
- _____ Sore throat today
- _____ Discharge from ear more than once
- _____ Discharge from ear today

Frequent earaches:

R _____ L _____ Both _____

_____ Complains of loud, constant ringing in the ears

_____ Hearing problems or deafness in family

- _____ Inattentive
- _____ Slow responding
- _____ Repeating grade
- _____ Says “huh?” or “what” often
- _____ Speech defect “baby talk”
- _____ Omits letters
- _____ Substitutes letters
- _____ Garbled speech
- _____ Distorted speech
- _____ Too soft
- _____ Too loud
- _____ Too high pitched
- _____ Too low pitched

Date of Re-screen _____ decibels		
Frequencies	R	L
1,000		
2,000		
4,000		
6,000 (optional)		

Tympanometry			
R Ear	P	F	Type Curve
L Ear	P	F	Type Curve

Referred by nurse to:

- _____ Family
- _____ Primary Care Provider
- _____ ENT Specialist
- _____ Speech/Language Pathologist
- _____ Audiologist
- _____ Other

NAME_____DATE_____		HEALTH EDUCATION		SCOLIOSIS SCREENING _____PASS _____WILL RECHECK AT _____SCHOOL _____REFER
GRADE_____TEACHER_____		_____		
SCHOOL_____				
HEIGHT_____INCHES WEIGHT_____POUNDS BMI_____PERCENT	<p>Rechecks, where indicated, will be done at school in the next few weeks.</p> <p>The dental screening is NOT intended to take the place of an annual visit to the dentist.</p> <p>If you have any questions, contact the nurse in your child's school.</p>			
				BLOOD PRESSURE _____/_____
HEARING L. PASS RECHECK R. PASS RECHECK		VISION PASS RECHECK	DENTAL _____RECOMMEND MORE FREQUENT BRUSHING _____EVIDENCE OF DECAY _____RECOMMEND ORTHODONTIC CONSULTATION _____PASS _____REFER	

NAME_____DATE_____		HEALTH EDUCATION		SCOLIOSIS SCREENING _____PASS _____WILL RECHECK AT _____SCHOOL _____REFER
GRADE_____TEACHER_____		_____		
SCHOOL_____				
HEIGHT_____INCHES WEIGHT_____POUNDS BMI_____PERCENT	<p>Rechecks, where indicated, will be done at school in the next few weeks.</p> <p>The dental screening is NOT intended to take the place of an annual visit to the dentist.</p> <p>If you have any questions, contact the nurse in your child's school.</p>			
				BLOOD PRESSURE _____/_____
HEARING L. PASS RECHECK R. PASS RECHECK		VISION PASS RECHECK	DENTAL _____RECOMMEND MORE FREQUENT BRUSHING _____EVIDENCE OF DECAY _____RECOMMEND ORTHODONTIC CONSULTATION _____PASS _____REFER	

Your child, _____, has participated in the
Hearing Screening Program in our school on _____, of this year.

At this time, he/she has no apparent hearing problems. Children may have temporary difficulty
hearing due to colds, allergies, or prolonged exposure to loud noise.

Please contact us if you have questions about your child's hearing.

School Administrator/Nurse

Your child, _____, has participated in the
Hearing Screening Program in our school on _____, of this year.

At this time, he/she has no apparent hearing problems. Children may have temporary difficulty
hearing due to colds, allergies, or prolonged exposure to loud noise.

Please contact us if you have questions about your child's hearing.

School Administrator/Nurse

(Suggested Content for Referral Letter to Parent)

(Date)

(Address)

(City, State, Zip)

Dear Parent:

The School Health Services program routinely screens students for possible hearing problems in order to identify any barrier to learning that might be corrected. Screening programs to find students with possible problems and to refer them to the appropriate health care provider are important for these reasons:

1. Temporary hearing loss causes students to miss crucial instructions in the classroom;
2. Parents may not be aware of a child's mild hearing loss in every day home situations;
3. Even mild losses may interfere with learning new vocabulary, which is critical for success in reading;
4. Hearing loss is invisible and the child may be blamed for "not paying attention;"
5. Hearing loss may be a sign of ear disease; and
6. Children with very mild losses or loss only in one ear may be experiencing school failure.

Your child failed our screening and rescreening for hearing problems. We feel it is important to your child's school success to have a professional evaluation for this. If a problem is found and corrected, it may help your student do better in his school work. Enclosed is a referral form to take to your doctor if we suspect a medical problem, or an audiologist, if that is more appropriate.

It is important to us to know what is found on the professional examination, so we would appreciate your returning the form to us, with the results of the exam.

Sincerely,

School Nurse

(School or Health Services letterhead)

SCHOOL			BUILDING			ROOM NUMBER		
STUDENT INFORMATION								
STUDENT NAME						AGE		GRADE
PARENT NAME				ADDRESS (INCLUDING CITY, STATE & ZIP)				
Your child has participated in the hearing screening program in our school this year, on _____.								
_____ Findings indicate a possible problem.								
_____ It is recommended that your child be evaluated by a physician for medical problems that may be interfering with the ability to hear								
_____ It is recommended that your child be evaluated by an audiologist or speech-language pathologist to determine the nature of the problem.								
If you have questions, please contact _____ / _____ School Nurse Phone								
OBSERVATIONS – Check all that apply.								
BEHAVIOR		SYMPTOMS		SPEECH		HISTORY		
Often says “huh?” or “what”		Discharge from ears		Speaks too loud or too soft		Seasonal allergies		
Is slow in responding		Complains of earaches		Distorted speech		Frequent upper respiratory infections		
Inattentive		Complains of ringing in ears		Turns one ear to speaker		History of hearing loss in family		
						History of past concerns re: hearing		
RESULT OF SCREENING (Specify type of screening test)								
A. SCREENING		DATE		B. RESCREENING		DATE		
Results of hearing screening				Results of hearing rescreening				
FREQUENCY		RIGHT	LEFT	FREQUENCY		RIGHT	LEFT	
1,000				1,000				
2,000				2,000				
4,000				4,000				
6,000 (optional)				6,000 (optional)				
				Tympanometry (See Attached graph)				
OBSERVATIONS				OBSERVATIONS				

(Continue on back)

This student was screened in the school setting using a puretone audiometer/and or tympanometry (impedance unit). Screening was done at _____ decibels. The student failed the screening and rescreening process. In addition, any other concerns are noted above. It is important that your evaluation results be communicated to the school as they are essential for our completion of follow-up. We will be happy to assure any recommendations are implemented, and give support to the family regarding this problem and any resulting treatment. You may send the report with the parent, or mail to this address:

SCHOOL NURSE: PLEASE COMPLETE THE FOLLOWING:

SCHOOL NURSE'S NAME	SCHOOL NAME	
SCHOOL NURSE'S ADDRESS (INCLUDING CITY, STATE AND ZIP)		PHONE NUMBER (INCLUDE AREA CODE)

RELEASE OF INFORMATION FORM

To the physician:

Please provide the school nurse named above with the results of this evaluation so that the school may be informed and make any necessary adaptations and/or do monitoring of condition.

Signature of Parent/Guardian

Date

SAMPLE: Tracking Form
HEARING SCREENING

[illegible]

HEARING SCREENING PROGRAM

SAMPLE: Statistical Report
(Internal Use)

School Year _____

Building Summary Report _____

District Summary Report _____

Building/District _____ Form completed by _____ Date _____

[illegible]

MISSOURI DEPARTMENT OF HEALTH AND SENIOR SERVICES

**DIVISION OF COMMUNITY HEALTH
Section for Community Health Systems and Support
Healthy Communities and Schools Unit**

**PO Box 570
Jefferson City, MO 65102-0570
(573) 751-6213**

**AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER
Services provided on a nondiscriminatory basis.**

**This publication may be provided in alternative formats such as Braille, large print and audiotape by contacting the
office listed above.**

TDD users can access the above phone number by calling 1-800-735-2966